LOW-DOSE METHYL BROMIDE FUMIGATION AS A QUARANTINE TREATMENT FOR FRESH PRODUCE

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This research program was instigated to develop a new protocol for the export of Australian capsicums to New Zealand. Australian capsicums are currently exported to New Zealand with methyl bromide fumigation at a dose of 40g m^{-3} methyl bromide for 2 hours at 17°C, however this treatment results in reduced fruit quality. Our research is investigating the efficacy of fumigating with lower concentrations of methyl bromide applied over longer treatment times with the aim of determining a dose efficacious against fruit flies and within the tolerances of the fruit.

Capsicums (*Capsicum annuum*) were fumigated with methyl bromide (MB) at a nominal treatment dose of 18g m^{-3} at 18°C for 5 hours as a quarantine disinfestation treatment against Queensland fruit fly, *Bactrocera tryoni* (Diptera: Tephritidae). Three large scale trials were conducted against each of the four immature lifestages, eggs, first, second and third instars. There were no survivors from the estimated 35,551 eggs, 53,720 first instars, 40,371 second instars and 43,901 third instars treated in capsicums, thereby resulting in an efficacy of >99.99% mortality at the 95% confidence level for each lifestage.

Commercial fruit were also fumigated under the same conditions and then held at 6°C for 16 days or 6°C for 10 days followed by 10°C for 6 days. This was to simulate transport at 6°C followed by retail display at 10°C. Fruit quality parameters of weight loss, total soluble solids and external quality including, visual appearance, skin wrinkling, skin pitting, and incidence and severity of rots were assessed and no significant adverse treatment effects were present.

The new protocol uses roughly half the concentration of fumigant but applied for double the treatment time to maintain the efficacy against Queensland fruit fly, a significant quarantine pest in Australia. Whilst the reduction in quantity of methyl bromide used is environmentally beneficial, the research was instigated to improve out-turn quality of the treated capsicums. The existing protocol for capsicum impacts fruit quality while the lower dose tested in our research had no significant effects on the range of fruit quality attributes tested.

Subsequent research in nectarines and peaches achieved complete mortality of all lifestages with a dose of 18g m^{-3} methyl bromide at 18°C for 5.5 hours and has resulted in a new protocol for the export of Australian nectarines to China. The research has now been extended to develop low-dose fumigation schedules for apple, pear, table grape, mango, plum, strawberry and citrus.